IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	: 10/501,760
Applicants	: Guenther HAMBITZER, et al.
Filed	: July 19, 2004
TC/A.U.	: 1795
Examiner	: Jonathan Crepeau
Docket No.	: 2945-173
Customer No.	: 06449
Confirmation No.	: 1108

DECLARATON OF Joachim HEITBAUM PURSUANT TO 37 C.F.R. § 1.132

I, Joachim HEITBAUM, hereby declare and state as follows:

1. I am a Professor of physical chemistry, now retired. After having studied physics I performed graduate and post-graduate studies at the University of Bonn, Germany and post-doc work at Case Western Reserve University, Cleveland, Ohio. I have extensive knowledge and experience in physical chemistry, in particular electrochemistry. This knowledge and experience was acquired during work at the University of Bonn, Germany, University of Witten Herdecke, Germany and at Chemetall GmbH, Frankfurt, Germany. Further details can be taken from a true and correct copy of my Curriculum Vitae, which is attached to this Declaration as Exhibit A. At the occasion of my 65th birthday the Journal of Applied Electrochemistry published a special issue with research papers dedicated by several colleagues in appreciation of my contributions to electrochemistry. A true and correct copy of a laudation therefrom, containing further facts regarding my scientific merits, is attached as Exhibit B. If called as a witness I could competently testify to the facts and opinions expressed in this Declaration.

2. I consider myself to be at least one having ordinary skill in the art in the field of rechargeable electrochemical battery cells to which the claims of the present application are directed.

3. I reviewed the present application, the Office Action dated November 13, 2008, and the cited prior art references, including WO 00/44061 to Hambitzer et al. (the English equivalent is U.S. Patent 6,709,789 ("the '789 patent")) and U.S. Published Application No. 2002/0102456 to Aihara et al.

4. Cells incorporating the claimed invention achieve an increase in safety by using a porous structure made of solid particles, which are not a salt. These particles are packed to achieve a high solid volume proportion of at least 40 %. The resulting increase in safety and the simultaneous failure to degrade the performance of an electrochemical cell were unexpected results. Prior to the claimed invention, it would have been assumed to be disadvantageous to have a porous structure of solid particles, which increases the weight and volume of the cell but provides no direct contribution to the cell reaction. Additionally, it would have been believed that the narrow pores resulting from high solid volume proportions would have resulted in an increase of the electrolytic resistance in the cell, with corresponding reduction of the maximum charging and/or discharging currents. The experimental investigations performed during the testing of the present invention and presented in the specification, suggest that the advantageous effects are mainly due to the prevention of a non-uniform growth of the active mass during the charging of the cell. (*See* e.g., pp. 5, 15-17 of the present application).

5. Achieving a solid volume proportion as high as is required by the claims, requires the use of special techniques. Simply substituting the fibrous carrier materials ("flexible fiber

compound structure") of the '789 patent with a carrier material in particulate form, as suggested on page 7 of the November 13, 2008 Office Action, would not result in a solid volume proportion as high as 40%. Special techniques such as mechanical concussion, approximating particles with a spherical shape, or using two solid particle sizes would need to be utilized. (*See* e.g., p. 8 of the present application).

6. The '789 patent makes no mention of any such techniques. Rather operation of the cell described in the '789 patent requires a high void volume, i.e. a small solid matter proportion, because the effect of salt added to the cell is based mainly on physical-chemical effects such as extraction of heat of fusion and chemical reactions occurring in case of a short circuit. Of course these effects depend on the amount of salt present and therefore a minimum amount of salt is required according to column 5, lines 61 - 63 of the '789 patent.

7. Another requirement of the cell described in the '789 patent is a large surface contact between the salt and substances formed at the electrode. If special techniques were used - as described in the section 5 above - to increase the solid volume proportion of the fibrous carrier material (or any other porous structure), this would reduce the volume available for salt deposition and it would reduce the large surface contact. Evidently this would be detrimental to the effects on which the operation of the '789 patent is based. Consequently I do not believe that a skilled reader would think of increasing the solid volume proportion of the solid matter layer described therein to an unusually high value, such as more than 40 %.

8. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so

made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: January 28, 2009

Prof. Dr. Joachim Heitbaum
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Curriculum Vitae

Since Oct 2005	Retired; Consulting of several Start-up Companies, Member of the Board of DECHEMA, Member of the Scientific Board of Karl-Winnacker-Institute
July 1989 – Sept 2005	In the Employment of Chemetall GmbH, Frankfurt; Head of Chemical Laboratories (since 1998 as Chief Technology Officer CTO), Responsible for Research and Development, Analytical Lab, Environment Health and Safety (EH&S), General Laboratory Organisation Project Management; Fields of Expertise: Chemical Surface Treatment, Lithium Chemistry
Oct 1985 – June 1989	University of Witten Herdecke Professor of Physical Chemistry and Director of the Institute Founding Dean of the Natural Science Faculty (1986 – 89)
Feb 1978 – Sept 1985	Member of the Science Faculty, University of Bonn Associate Professor of Physical Chemistry (1981) Appointment as University Lecturer (Habilitation) (1978) Thesis on "Intermediates in Electrochemical Reactions"
Apr 1970 – Jan 1978	Graduate and Post-graduate Studies of Electrochemistry Scientific Assistant at the Institute of Physical Chemistry, University of Bonn (Prof. Wolf Vielstich) Post-Doc at Case Western Reserve University, Cleveland, Ohio (Prof. Ernest Yeager) (1976) PhD (1972), Thesis on "Electrooxidation of Hydrazine"
Nov 1961 – Mar 1970	Study of Physics, Diploma as a Physicist (1970)
Apr 1961 – Oct 1961	Internship at Niederrheinische Hütte AG, Duisburg
Apr 1947 – Mar 1961	School Education
30. Sept 1940	Date of Birth

Publications: more than 80 publications in refereed scientific journals, numerous marketing related publications and presentations during my time in industry, editor of the book „The Phosphating of Metals" (3rd Edition 2005)

Memberships: German Society of Chemists (GDCh), German Bunsen Society of Physical Chemistry, Society for Chemical Technology and Biotechnology (DECHEMA), German Corrosion Society (GfCorr), International Society of Electrochemistry (ISE), American Electrochemical Society (inactive member), Arbeitsgemeinschaft Elektrochemischer Forschungsinstitute (AGEF)

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Professor Dr Joachim Heitbaum

In September 2005 Prof. Dr Joachim Heitbaum celebrated his 65th birthday. To mark the occasion, several colleagues, who had had the opportunity to collaborate with Prof. Heitbaum and to benefit from his work, agreed to dedicate research papers for a special issue of this journal in appreciation of his significant contributions to electrochemistry.

To the electrochemical community Prof. Heitbaum is known for his pioneering work on the development of techniques for the on-line detection of electrochemical reaction products. One of these, differential electrochemical mass spectrometry (DEMS), was based on an approach originally suggested by Bruckenstein, but improved in such a way that the detection of volatile products became possible within a 10th of a second and adsorbates could be detected with a sensitivity of 1% of a monolayer. This technique has been continuously developed and is presently used by many groups working on electrocatalysis, batteries and fuel cells. Professor Heitbaum was also the first to couple an electrochemical cell to a spray ionisation technique. Spraying techniques have since undergone further development and the original thermospray technique has been replaced by electrospray ionisation. As electrochemistry plays a significant role in the mechanism of electrospray Heitbaum's pioneering work is also well recognized in the electrospray community.

Apart from electrocatalysis and mass spectrometric techniques, Heitbaum was also active in the fields of electrochemical sensor systems and electrochemical energy storage devices such as innovative rechargeable lithium batteries. Later, in his position at Chemetall GmbH, Frankfurt, he was very active in the development of innovative industrial products for metal surface treatment, mainly to ensure corrosion protection. For this reason he initiated a scientific network with universities, research centres, industry and start-up companies.

Joachim Heitbaum received his diploma degree in Physics in 1970 and his PhD degree in 1972 under the supervision of Prof. W. Vielstich from the University of Bonn. He then stayed at the Institute of Physical and Theoretical Chemistry as a senior scientist and, after a research stay in 1976 with Prof. E. Yeager in Cleveland, finished his habilitation in 1978 with a thesis on "Intermediates in Electrochemical Reactions". He was appointed Professor at the same institute in 1981. In 1985 he accepted a chair of Physical Chemistry at the University of Witten-Herdecke, where he was Dean of the newly founded science department from 1986 to 1989. In 1989, Prof. Heitbaum moved to a position at Metallgesellschaft AG/Chemetall GmbH, and became director in 1993. He was an outstanding leader of the global surface treatment R&D activities until his retirement in September 2005. While in industry, Prof. Heitbaum never lost his close contact with universities and his interest in the dialogue between fundamental research and industrial development. He is an active member of the German Chemical Society (GdCh) and was chairman of the Section "Angewandte Elektrochemie" (Applied Electrochemistry) from 1993 to1998. He is active in several committees in the GdCh and in the DECHEMA (German Society for Chemical Engineering and Biotechnology), where he heads the "working group Electrochemical Processes". He was a member of the board of directors of the German Research Association for Surface Treatment (DFO) from 1994 to 2004. From 1997 to 2003 he served as a member of the "Industry Advisory Board" of the Forschungszentrum (FZ) Jülich, which he presided over for 3 years. From 1994 to 2002 he was also a member of the advisory board of the Institute of Interface and Vacuum Physics (IGV) of the FZ Jülich, acting as chair for several years. Since 2004 he has presided over the *"Strukturkommission"* of the Institute for Layers and Interfaces (ISG). Prof. Heitbaum was one of the founding members of the AGEF (Arbeitsgemeinschaft elektrochemischer Forschungsinstitute) and was a member of several scientific committees of international congresses.

Although now retired, Prof. Heitbaum maintains a keen ongoing interest in science and continues to be active on many committees where his scientific advice is always welcome.

Margret Wohlfahrt-Mehrens
Helmut Baltruschat
April 2006